CIRCULAR No. 410 OCTOBER 1936
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

RESULTS FROM BREEDING RABBITS THAT ARE SUCKLING YOUNG

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PURPOSE OF THE EXPERIMENT

Those who raise domestic rabbits commercially for meat and fur must conduct their operations on an intensive basis, just as do other producers of domestic livestock. In the older commercial rabbit-producing sections it has been the practice to sell young rabbits directly from the doe at approximately 2 months of age, when their average weight is 3 to 3½ pounds, and then to breed the doe immediately. Maintaining this schedule of 31 days for gestation and 2 months for lactation enables the doe to produce a litter every 3 months, or four litters a year, though difficult breeding during the fall molt may disrupt the schedule.

Since rabbits do not have a definite oestrous cycle similar to that of other domestic animals and since mating normally is necessary to ovulation, arrangements were made to determine experimentally whether rabbits could be satisfactorily bred while suckling young.[1]

If this should be found possible, practical rabbit breeders would be able to speed up breeding operations and thereby obtain a greater turn-over on their investments. It was realized also that such an experiment would make a contribution to fundamental research, since it has been maintained on rather meager data that rabbits normally will not conceive while suckling young, particularly if the litters are large.[2]

FEEDING AND MATING THE DOES

The experiment was conducted at the United States Rabbit Experiment Station at Fontana, in southern California, in 1932, 1933, and 1934. All animals used were New Zealands, a medium-type breed weighing 10 to 11 pounds at maturity. Approximately two-

[1] Acknowledgment is made of the assistance of Geo. S. Templeton, director of the U. S. Rabbit Experiment Station, in supplying much of the detailed information, and of that of Allan Suitor, superintendent of the station rabbitry, in keeping the records.

[2] Hammond, J., and Marshall, F. H. A. reproduction in the rabbit. 210 pp., illus. Edinburgh and London. 1925.

thirds were juniors, that is, stock 8 to 10 months old, at the beginning of the experiment. The feed was carefully calculated as to digestible nutrients. About 80 percent of the does received a ration having a nutritive ratio of 1:3.7 (1 part of digestible protein to 3.7 parts of digestible carbohydrates and fats), and the remaining 20 percent were equally divided on rations having nutritive ratios of 1:4.2, 1:3.2, and 1:2.7. In all cases the quantity of concentrates supplied was so regulated that a good quality of alfalfa hay comprised exactly 60 percent of the ration.

The 120 does used were put into three equalized groups containing 40 each. In one group they were scheduled to be bred 28 days after each kindling, in another 42 days after, and in the third 56 days after. All the young were weaned at 56 days of age. This breeding schedule meant, therefore, that, with successful mating, in the first case (the 28-day schedule), all but the last 3 days of the entire pregnancy period of 31 days would be concurrent with the last 28 days of lactation; in the second case (the 42-day schedule), the first 2 weeks of pregnancy would concur with the last 2 weeks of lactation; and in the third case (the 56-day schedule), the suckling period and pregnancy would be dissociated, but pregnancy would immediately follow lactation.

A doe was turned loose in the buck's hutch for a short period on the scheduled breeding day and if necessary each day thereafter for several days. If service was not thus accomplished the doe was then held and prompt service usually resulted. Such favorable results were obtained from holding the doe that this is now the accepted breeding practice at the station. Within 2 days after the doe kindled, the larger litters were culled to seven young. Since for experimental reasons does were permitted to raise their own progeny only, the smaller litters were not increased by the transfer of young. At any time when a litter was reduced to two young or less the doe was bred immediately and the young were weaned a few days before she was due to kindle. The results of the experiment, which ran for a full calendar year, are shown in the accompanying tables (1–7).

INFLUENCE OF PREVIOUS LITTERS

Data on the pregnancy results of the 56-day schedule, presented in table 1, show that a slightly higher percentage of the does that had weaned litters of seven and of six young became pregnant than did does weaning litters of five and four.

The does on the 42-day and 28-day schedules, that is, those still suckling litters for 14 and 28 days, respectively, after breeding (tables 2 and 3), show only about 50 percent pregnancies for does that had litters of seven young and in general a progressive increase in the percentage of pregnancies with a decrease in the size of litters. The heavier lactation required of does for 6-week-old young (42-day schedule) lessens somewhat the possibility of pregnancy at that time as compared with does suckling only 4-week-old young (28-day schedule). This is especially true with does nursing large litters. For does suckling litters of three or more young the resulting pregnancy indicates that the suckling of the larger litters reduces slightly the chances of pregnancy.

TABLE 1.—*Pregnancy results from a 56-day breeding schedule with does that had weaned litters of three or more young*

Number in litter weaned and result of mating	Matings on day indicated							Passed or pregnant
	Fifty-sixth	Fifty-seventh	Fifty-eighth	Fifty-ninth	Sixtieth	Seventieth	Total	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Percent*
7—Passed	3	1	1				5	24
Pregnant	9	2	5				16	76
6—Passed	3						3	14
Pregnant	15		1	2			18	86
5—Passed	3		1				4	29
Pregnant	9				1		10	71
4—Passed	3		1	1		1	6	30
Pregnant	11	2	1				14	70
3—Passed	2						2	22
Pregnant	6			1			7	78
Total:								
Passed	14	1	3	1		1	20	24
Pregnant	50	4	7	3	1		65	76

TABLE 2.—*Pregnancy results from a 42-day breeding schedule with does that were suckling litters of three or more young*

Number in litter suckled and result of mating	Matings on day indicated								Passed or pregnant
	Forty-second	Forty-third	Forty-fourth	Forty-fifth	Forty-sixth	Forty-seventh	Forty-eighth	Fiftieth	Total	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Percent*
7—Passed	7	3	1			1			12	50
Pregnant	11			1					12	50
6—Passed	5	4		1		1	1		12	40
Pregnant	11	2	3		2				18	60
5—Passed	2	1		1					4	21
Pregnant	8	4	1			1		1	15	79
4—Passed		5		1	1				7	28
Pregnant	15	1	1		1				18	72
3—Passed		2							2	20
Pregnant	4	3			1				8	80
Total:										
Passed	14	15	1	3	1	2	1		37	34
Pregnant	49	10	5	1	4	1		1	71	66

TABLE 3.—*Pregnancy results from a 28-day breeding schedule with does that were suckling litters of three or more young*

Number in litter suckled and result of mating	Matings on day indicated									Passed or pregnant
	Twenty-eighth	Twenty-ninth	Thirtieth	Thirty-first	Thirty-second	Thirty-third	Thirty-fifth	Thirty-sixth	Total	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Percent*
7—Passed	11	2	1	3		1		1	19	43
Pregnant	18	3				2	2		25	57
6—Passed	7	2		1		1			11	30
Pregnant	21	2	2		1				26	70
5—Passed	2	1		1					4	27
Pregnant	8	1		1	1				11	73
4—Passed	2			1	2				5	26
Pregnant	12	1	1						14	74
3—Passed	2								2	33
Pregnant	3	1							4	67
Total:										
Passed	24	5	1	6	2	2		1	41	34
Pregnant	62	8	3	1	2	2	2		80	66

SERVICE ACCEPTANCES

Approximately 70 percent of the does (table 4) on the 28-day schedule and 75 percent on the 56-day schedule accepted service on the first day liberated in the buck's hutch. Nearly three-fourths of all first-day matings resulted in normal pregnancies, even though does on the 42-day schedule did not mate so readily on the first day. All but one doe mated within 8 days of the time set, and this one, on the 56-day schedule, mated 14 days after weaning her previous litter. About 93 percent of the does in all three groups accepted service by the fourth day of the scheduled time.

TABLE 4.—*Service acceptances on first day of breeding schedule and resulting pregnancies when does were suckling or had weaned litters of three or more young*

Number in litter suckled or weaned	Service acceptances on first day			Pregnancies from first-day matings		
	28-day schedule	42-day schedule	56-day schedule	28-day schedule	42-day schedule	56-day schedule
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
7	66	75	57	62	61	75
6	76	53	86	75	69	83
5	67	53	86	80	80	75
4	74	60	70	86	100	78
3	83	40	89	60	100	75
Average	71.1	58.3	75.2	72.1	77.7	78.0

The breeding efficiency of does on various days after kindling and while still suckling less than three young is shown in table 5. The data presented include the day service was accepted and show whether

TABLE 5.—*Pregnancy results with does having less than three young in their litters at time of service*

Day mated on or after kindling	Pregnancies and passes resulting from matings							
	Two in litter		One in litter		None in litter		Total	
	Passed	Pregnant	Passed	Pregnant	Passed	Pregnant	Passed	Pregnant
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
On day				2	4	4	4	6
First		4		2	8	7	8	13
Second	1	1			6	1	7	2
Fourth	1				2	1	3	1
Fifth					1	3	1	3
Sixth		2		1	1	1	1	4
Seventh	1	2			1	1	2	3
Eighth						1		1
Tenth	2				1		3	
Eleventh		2		1	1		1	3
Twelfth			1			1	1	1
Thirteenth	1			1			1	1
Fourteenth	1	1		1			1	2
Fifteenth		1						1
Seventeenth		1						1
Eighteenth					1		1	
Thirty-sixth		1						1
Fortieth	1						1	
Fifty-sixth		1						1
Fifty-eighth				1				1
Total	8	16	1	9	26	20	35	45
Percent	33	67	10	90	57	43	44	56

pregnancy resulted, but the table in no way indicates the number of breeding trials required. For the low number of resulting pregnancies (little more than 50 percent) two explanations seem logical: Any sickness of the doe at the time of mortality of the young would sap her vitality and thereby reduce her breeding efficiency; and any doe inherently unable to produce or to nurse more than two young satisfactorily would naturally have a low breeding level.

The director of the rabbit station, in reviewing additional records at the station, found for each day (1–56) after kindling that several does mated just after they had lost their entire litter or while they were suckling less than three young.

SIZES OF LITTERS AND WEIGHTS OF YOUNG

The size of the litter and the weight of the young at 56 days of age in the successive litters are shown in table 6. The breeding schedules arranged are not responsible for all the differences that appear. Each group with the fewer number of consecutive litters has included in it that similar portion of all those groups producing a higher number of consecutive litters. For example, the 38 cases of 2 consecutive litters in the 28-day breeding schedule include the data on the first 2 litters of the 12 cases producing 3 litters in succession, and in these 12 cases are included the pertinent data from the 5 does producing 4 successive litters, and in turn these include the pertinent data from the 1 doe producing 5 successive litters. In other words, there were only 26 cases of does producing 2 litters in succession and no more, 7 cases of does producing 3 litters in succession and no more, 4 cases of does producing 4 litters in succession and no more, and only 1 case of a doe producing 5 successive litters. This procedure permitted the inclusion of all pertinent unbiased data, since it is self-evident that no subsequent litter in any way influences a preceding litter.

TABLE 6.—*Average number and average weight per litter of young at weaning, shown for consecutive. litters under the three breeding schedules*

Breeding schedule	Litters		Average size of litter at weaning					Average weight of young at weaning				
	Consecutive	Total produced	First	Second	Third	Fourth	Fifth	First litter	Second litter	Third litter	Fourth litter	Fifth litter
	No.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
28-day	2d	38	5.16	5.00	------	------	------	3.26	3.26	------	------	------
	3d	12	5.08	4.17	4.92	------	------	3.10	3.38	3.41	------	------
	4th	5	6.00	4.80	5.20	5.60	------	2.83	3.22	3.54	3.04	------
	5th	1	6.00	6.00	4.00	6.00	5.00	2.28	3.05	4.12	3.08	3.36
42-day	2d	31	4.52	4.48	------	------	------	3.21	3.30	------	------	------
	3d	12	4.50	4.32	5.25	------	------	3.12	3.25	3.33	------	------
	4th	3	5.33	5.00	5.00	4.33	------	3.21	3.30	3.55	3.36	------
	5th	1	4.00	4.00	4.00	4.00	3.00	3.95	3.12	3.50	3.38	3.53
56-day	2d	30	5.27	5.47	------	------	------	3.13	3.21	------	------	------
	3d	14	5.64	5.78	4.71	------	------	2.86	3.17	3.24	------	------
	4th	6	5.66	5.33	4.16	4.83	------	2.92	3.03	3.42	3.16	------

It will be noted that only 6 does of the 40 on the 56-day schedule produced the theoretically possible 4 consecutive litters, that only 1 of the 40 does on the 42-day schedule produced the possible 5 consecutive litters, and that not 1 of the 40 does on the 28-day schedule produced 6 consecutive litters, as would be possible with a successful

breeding on such a schedule. Even though the does on the 56-day schedule weaned more young per first litter than the other two groups, they actually weaned second litters with an average of one-fifth of a rabbit more than their own first ones. While the does on the 42-day schedule merely maintained their rather low level of four and one-half weaned young per litter, the does on the 28-day schedule weaned second litters that on the average were one-sixth of a rabbit smaller than their first. The average weight at weaning of the second consecutive litters, however, was equal to or larger than the weaned weight of first litters. The litters from does on the 56-day schedule averaged lowest in weight, but these also had a greater number of young per litter.

The average number of young weaned per third consecutive litter for those does on the 42-day schedule was actually greater by three-fourths of a rabbit than the first litters, largely perhaps because the average of the second litters was even lower than the very mediocre average of the first. It should be kept in mind that about two-thirds of the does were juniors when the experiment began. The average number weaned per third consecutive litter of does on the 56-day schedule was lower than either of the other two groups because of the increased average in number of young in second litters over the first as well as the much higher average of these first two litters as compared with those of the other two groups. The average weight at weaning of young from the third consecutive litters was greater in all cases than that of their first litters, but the young from does on the 56-day schedule weighed less at weaning than young from the other two groups.

The average number of young weaned per litter from does producing four consecutive litters on the 56- and the 42-day schedules was less with each litter in succession, with the exception of the fourth litters of the 56-day group and the third litters of the 42-day group. The average number of young per fourth successive litter of the does on the 28-day schedule was greater than any of the previous litters except the first. Only three does, however, were considered here.

The average weight of young at weaning per litter in nearly all groups increased consistently up to and including the third successive litter, but in all cases the weight of the young from the fourth consecutive litters averaged less than in the third consecutive litters but still more than in the first litters.

CASES OF FIVE CONSECUTIVE LITTERS

There were only two does producing five litters in succession according to breeding schedule, one on the 28-day and one on the 42-day schedule. This number is not sufficient to permit definite conclusions. It should be noted, however, that one doe on the 28-day schedule, with only a few days between lactation periods (i. e., while suckling one litter and developing another at the same time), was able in the fifth consecutive litter to wean five young averaging 3.36 pounds each at 56 days of age. For the entire period she averaged 5.4 weaned young per litter, and these 27 young weighed on the average 3.18 pounds at 56 days of age. This particular doe was born on June 14, 1932, kindled her first litter January 19, 1933, weaned her fifth litter

November 10, 1933, accepted service in October, but did not produce a litter in November, all within 1 year's time. She never refused service on the first day of each scheduled mating, except that the first breeding required three trials. The next year this same doe produced four consecutive litters regularly on a 42-day schedule. She in that year produced 21 young, averaging 3.51 pounds live weight at 56 days of age. Evidently her previous year's heavy schedule did not impair her breeding efficiency. The case is exceptional, and the story would be different, of course, with others.

The doe that had five consecutive litters on the 42-day schedule, with approximately 2 weeks longer periods between lactations raised only three weaned young in the fifth litter. These averaged 3.53 pounds each at 56 days of age. This doe's record for the entire period was 19 young, averaging 3.8 young per litter. She had a total meat production of 66.4 pounds live weight for the year and an average weight per young weaned at 56 days of 3.49 pounds. Though she was a consistent producer, the number of weaned young per litter was too small for the most profitable production. This doe was born November 28, 1930, and weaned her seventh litter of four on December 8, 1932, shortly after this breeding experiment started. She then produced five more consecutive litters and was still suckling the last litter of four, which was 42 days old, when the experiment ended. This last litter had an average weight at weaning at 56 days of 3.55 pounds. Records show that this doe accepted service the first day in every case but one.

NUTRITIVE RATIO OF RATIONS

None of the does producing the three or more consecutive litters (table 7) received rations having a nutritive ratio narrower than 1:3.7, except one doe that produced three consecutive litters in the 28-day schedule group. One of the does that produced four consecutive litters was fed a ration having the widest nutritive ratio (1:4.2). One should not conclude from these rather meager data on the narrower nutritive ratio that a higher protein level within limits is not conducive to a higher breeding efficiency. The data set forth in table 7 are for the purpose of making the information complete in this particular respect in this experiment.

TABLE 7.—*Protein level of rations of rabbits on the different breeding schedules*

Breeding schedule	Consecutive litters	Litters while on indicated nutritive ratio				Total litters produced
		1:4.2	1:3.7	1:3.2	1:2.7	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*
28-day	2d	3	29	3	3	38
	3d	1	10	----------	1	12
	4th	1	4	----------	----------	5
	5th	----------	1	----------	----------	1
42-day	2d	2	25	1	3	31
	3d	1	11	----------	----------	12
	4th	----------	3	----------	----------	3
	5th	----------	1	----------	----------	1
56-day	2d	2	24	2	2	30
	3d	1	13	----------	----------	14
	4th	----------	6	----------	----------	6

SUMMARY AND CONCLUSIONS

Data resulting from this 1-year breeding experiment with 120 rabbit does showed that more than two-thirds of them while suckling litters of various sizes accepted service the first day presented to the buck after each kindling, that is, over 70 percent of those on the 28-day schedule, about 75 percent of those on the 56-day schedule, and nearly 60 percent of those on the 42-day schedule. Nearly 75 percent of these matings on the first day were successful, though somewhat fewer pregnancies resulted when the does were suckling the larger litters.

Ninety-three percent of all the does accepted service within 4 days of the above-scheduled time. The breeding efficiency of does suckling young 42 days was slightly less than that of does suckling young 28 days or of those bred just after weaning young.

So many factors affect the number of young per litter weaned and the weight at weaning of young at 56 days of age that the effect on these two points of mating does that are suckling young has not yet been definitely determined. Apparently there is no measurably harmful effect on size of young through the third consecutive litter, but the weight of young of the fourth consecutive litter in all cases averaged less, though the number per litter was still somewhat greater than in the previous litter.

Two does, one starting with her seventh litter and the other with her first, produced five consecutive litters while suckling young during 14 days and 28 days, respectively, of the pregnancy period. Both does accepted service on the first day of scheduled mating. A majority of the does, however, produced only two consecutive litters on schedule, even when mated the same day a litter was weaned.

When the general effect on the doe as well as on the young is given due consideration it is not deemed advisable for commercial rabbit raisers to breed their does on a 28-day schedule if the young are weaned when 56 days old. The 42-day schedule may be desirable, particularly during spring and early summer—the natural breeding season—or when certain other modifications are in operation, such as earlier weaning. The breeding of does just after weaning their young at 56 days of age is being followed satisfactorily in many commercial rabbitries. No breeding schedule should be rigidly held to if the general condition of the doe is not satisfactory.

U. S. GOVERNMENT PRINTING OFFICE: 1936

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